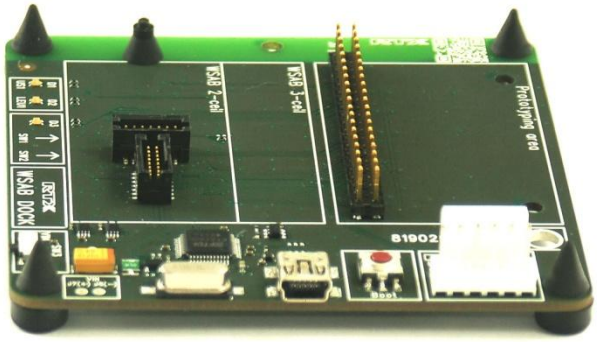
RTX41xx

DVK (WSAB) Docking Station

Variants covered by this document:
RTX4100-DVK
RTX4140-DVK



User Guide

DVK Docking Station [UG7]

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1 Introduction

1.1 General Description

This document serves as a manual for the Wireless Sensor Application Board (WSAB) Docking Station provided in the RTX41xx Development Kit (DVK). With the WSAB inserted in the Docking Station it is possible to develop and test applications running on a RTX41xx module. The WSAB Docking Station provides the WSAB with power. USB power or an external supply is supported. The USB interface on the WSAB Docking Station provides two virtual COM ports on the PC which can be used for basic collocated application (CoLA) development and debugging. Advanced application development and debugging is supported by connecting an RTX2040 Unity-II debugger (must be bought separately). Further the WSAB Docking Station provides a pin header for hardware prototyping and application development.

For further information on the WSAB please refer to the WSAB userguide ([UG6]).

1.2 Module variants covered by this document

This document covers the common docking station for both the RTX4100 and RTX4140 WiFi modules.

1.3 Document History

V1.3, added RTX4140	TM	2013-06-06
V1.2, Updated references	TM	2013-02-19
V1.1, -Docking connector J9 pin 23 and 26 description corrected. -Added description of WSAB pin functions in table documenting the docking connector J9 -Updated board documentation	TM	2012-10-29
V1.0, Official release	TM	2012-07-08

Disclaimer: This document can be subject to change without prior notice.

1.4 SW/HW Version

This document is applicable for the following versions.

- WSAB_DOCK version V2RA (PCB partnumber 81902912)

1.5 Document References

[DS1]. RTX4100_Datasheet_DS1.pdf.
[DS2]. RTX4140_Datasheet_DS2.pdf.

[UG3]. RTX4100_User_Guide_Application_Development_UG3.pdf.
[UG4]. RTX4100_User_Guide_Application_Debugging_UG4.pdf.
[UG5]. RTX4100_User_Guide_Platform_Update_UG5.pdf.
[UG6]. RTX4100_User_Guide_WSAB_UG6.pdf.

2 Features

The WSAB Docking Station includes the following features.

- **WSAB Docking connector:** The Wi-Fi Sensor Application Board (WSAB) docking connector accepts the WSAB that includes a RTX41xx Wi-Fi Module.

- **Mini USB connector:** The USB connector can provide the WSAB Docking Station and the docked WSAB with power. Meaning that no external power supply is needed for SW development. Further the USB interface provides two virtual COM ports on the PC. The COM ports can be used for basic COLA application development and debugging, see ([UG3]) and ([UG4]).

- **Virtual COM port activity LEDs:** Two dual color LEDs indicate activity on the virtual COM ports provided through the USB interface

- **WSAB LED duplicate:** One dual color LED on the WSAB Dock connected in parallel with the LED on the WSAB makes it easy to se the LED status with the WSAB docked.

- **40 pin expansion-/debug-connector:** Expansion connector, with all RTX4100 IO's available, for adding customized application add-on boards. Can be used for adding new sensor devices, power supplies etc.

- **Boot button:** The Boot button is used for platform formware updates, see reference ([UG5]). For CoLA application updates the Boot button is not required.

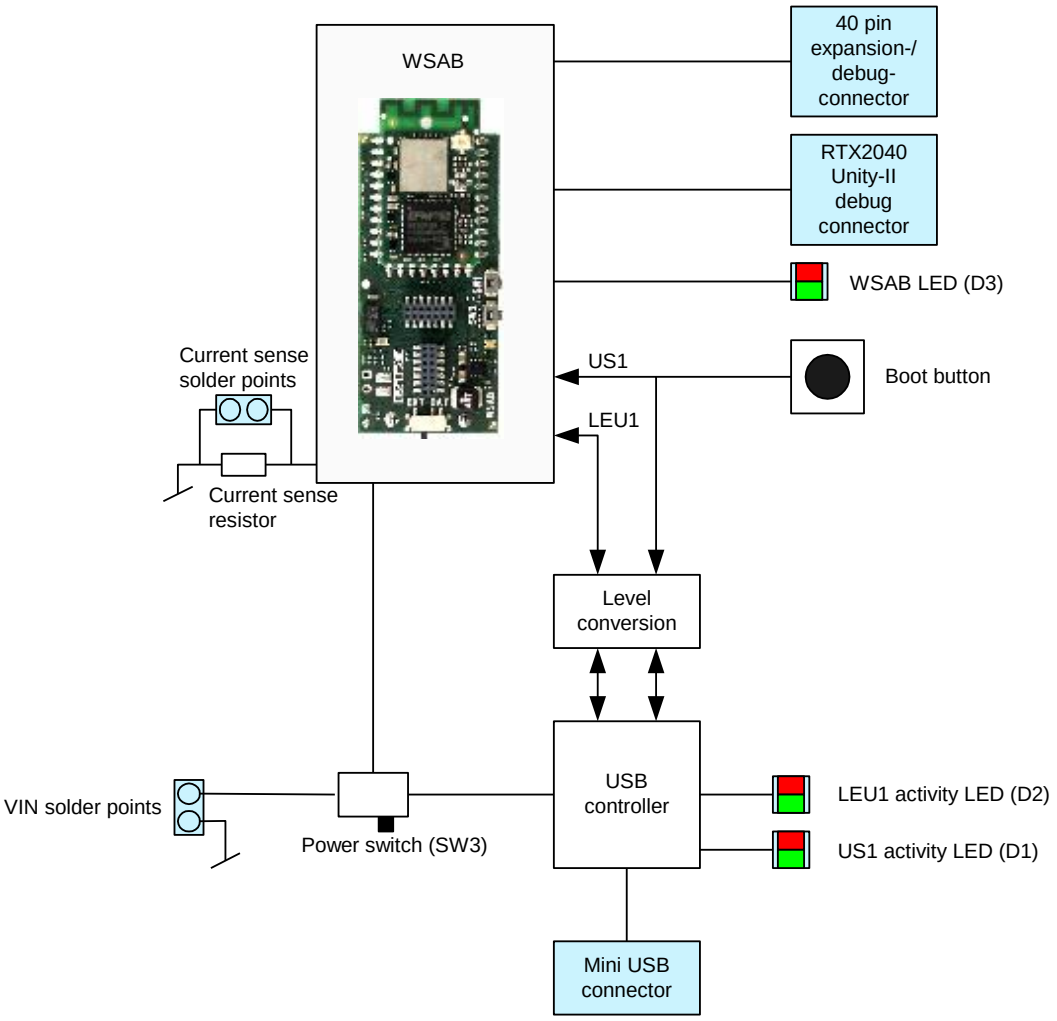
- **Power supply:** The WSAB can be powered from the USB connector or from an external power supply. The power source can be selected using a switch on the WSAB Docking Station.

- **Current sensing resistor:** A resistor in the ground path of the external power supply enables characterization of the current profile of the application simply by using an oscilloscope.

- **RTX Unity-II debug connector:** For advanced application development and debugging an RTX2040 Unity-II debugger can be connected (must be bought separately)

- **Docking Station dimensions:** 86x86mm

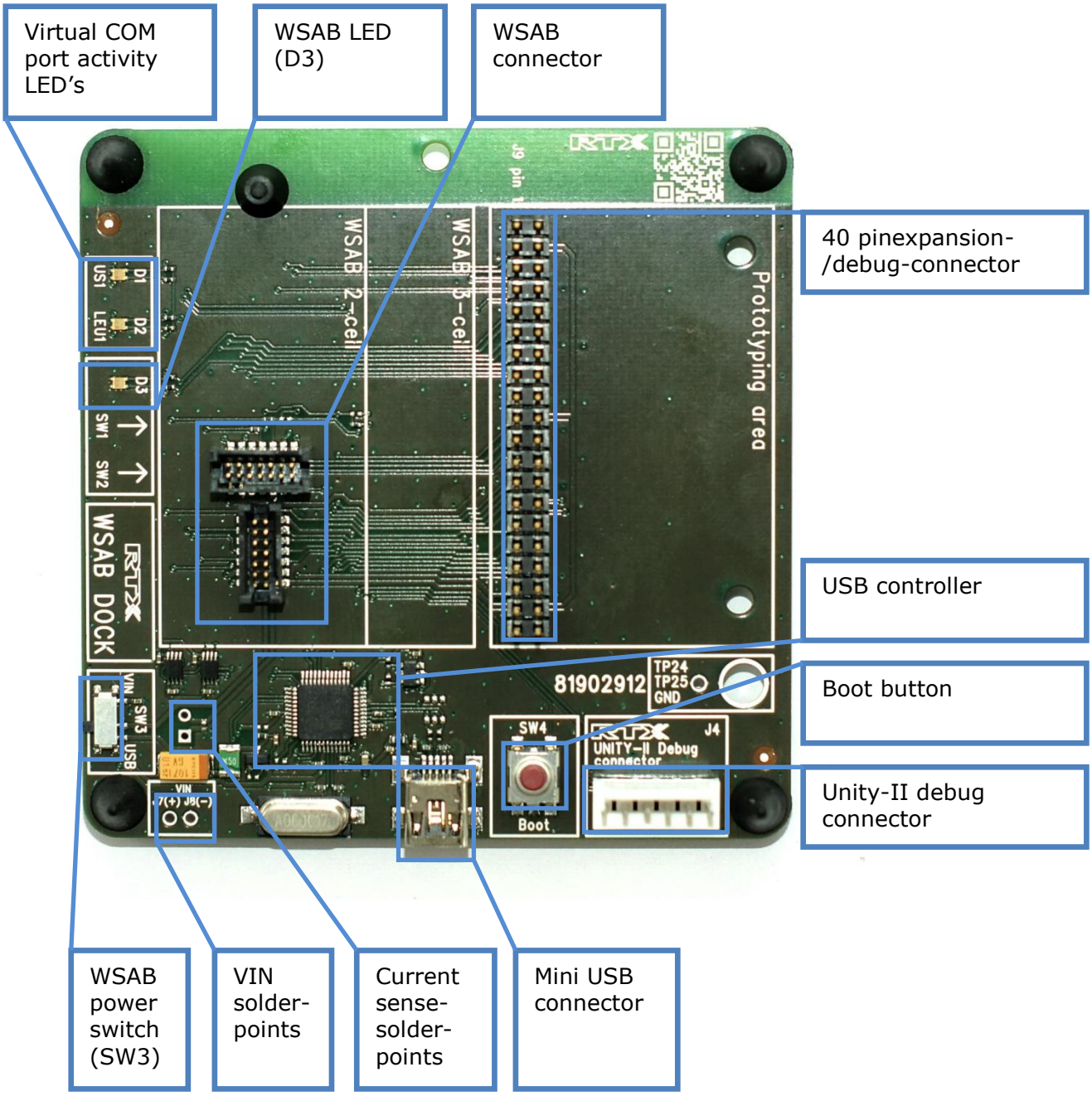
3 WSAB Docking Station Block Diagram



Figur 1 WSAB Docking Station blockdiagram

4 Hardware layout

The layout of the WSAB Dock is shown below. See detailed component placement and schematics in section 9.



5 Power supply

The WSAB Docking Station board is USB powered and requires a USB host capable of delivering 500mA.
The docked WSAB can be powered from either the USB supply or an external power source (VIN solder points). A switch (SW3) in the WSAB Docking Station can be used to with between the two power options.

Note! Be certain that the switch on the WSAB is set to external power source when using the supply options from the Docking Station. The supply selection switch on the WSAB should, when monted on the Docking Station, point toward the Prototyping area.

5.1 USB power

USB power can be used to easily supply the module when developing and testing SW functionality. If a power source is not connected to the VIN solder terminals SW3 can be used as an ON/OFF switch for the WSAB.

5.2 External power

The external power option is used when it is desired to control the input voltage to the RTX41xx module. This will be usefull in some testing scenarios eg. battery management testing etc.
The VIN solder points are connected directly to the module supplies, so the operating voltage requirements stated in the RTX4100 module datasheet must be complied with, see ([DS1]).

6 WSAB docking connector

The table below shows the WSAB connections in the WSAB docking connectors and their function.

Docking connector J1			
J1 Pin no.	**Type**	**Module pin name**	**WSAB Docking Station function**
1	I/O	PA0	Connected to Expansion connector (J9)
2	O	RESETn	Connected to Expansion connector (J9)
3	I/O	PA1	Connected to Expansion connector (J9)
4	I/O	PB12	Connected to Expansion connector (J9)
5	I/O	PA3/PC1	US1_RX UART_RX signal used for eg. COLA application download and debugging via USB virtual COM port. Also connected to Expansion connector (J9)
6	I/O	PB8	Connected to Expansion connector (J9)
7	I/O	PA4/PC0	US1_TX UART_TX signal used for eg. COLA application download and debugging via USB virtual COM port. Also connected to Expansion connector (J9)
8	GND	GND	GND_WSAB
9	I/O	PB7	Connected to Expansion connector (J9)
10	I/O	PB13	Connected to Expansion connector (J9)
11	GND	GND	AGND Analog ground may be used as reference for RTX4100 analog I/O's Connected to Expansion connector (J9)
12	I/O	PB14	Connected to Expansion connector (J9)
13	I/O	PC4/PD4	Connected to Expansion connector (J9)
14	I/O	PC5/PB11	Connected to Expansion connector (J9)

Docking connector J3			
J3 Pin no.	**Type**	**Module pin name**	**WSAB Docking Station function**
1	Power	VCC2(*)	+3V5 Step up voltage from WSAB Connected to Expansion connector (J9)
2	Power	VIO	VDD_EFM VIO reference voltage for RTX2040 Unity-II (J4) Also connected to Expansion connector (J9)
3	I/O	PF2	Activates red color in D3 LED Connected to Expansion connector (J9)
4	I/O	PD5	Connected to Expansion connector (J9)
5	I/O	PF0	DBG_SWCLK Clock for RTX2040 Unity-II (J4)

			Connected to Expansion connector (J9)
6	I/O	PF1	DBG_SWDIO Data for RTX2040 Unity-II (J4) Also connected to Expansion connector (J9)
7	I/O	PC2	Activates green color in D3 LED Connected to Expansion connector (J9)
8	I/O	PC3	Connected to Expansion connector (J9)
9	I/O	PC6	LEU1_TX Low energy UART_TX signal used for terminal demo application via USB virtual COM port Also connected to Expansion connector (J9)
10	I/O	PC7	LEU1_RX Low energy UART_RX signal used for terminal demo application via USB virtual COM port Also connected to Expansion connector (J9)
11	GND	GND	GND_WSAB
12	Power		VEXT WSAB power supplied from SW3. Can be set for either USB or external power Also connected to Expansion connector (J9)
13	Power		VBAT+ from WSAB Also connected to Expansion connector (J9)
14	Power		VBAT- from WSAB Also connected to Expansion connector (J9)

(*) Only valid when WSAB is configured for 2-cell operation. 2-cell operation is the default configuration.

7 Expansion-/debug-connector

The expansion connector, with all RTX4100 module IO's available, can be used for adding customized application add-on boards. eg. adding new sensor devices, power supplies etc..

The below table shows the pinout of the expansion-/debug-connector.

Docking connector J9			
J9 Pin no.	**Type**	**Module pin name**	**WSAB Docking Station function**
1	GND		GND
2	Power	VIO	VDD_EFM RTX4100 module VIO reference voltage
3	GND		GND_WSAB Supply current by external connected circuitry using this ground reference will be included in the current measurement using the current sense solder points.
4	Power		VBAT+ from WSAB
5	I/O	PA0	See module pin name (reserved for i2C communication on the WSAB)(*)
6	I/O	PA1	See module pin name (reserved for i2C communication on the WSAB) (*)
7	I/O	PB12	See module pin name (reserved for MEMS on WSAB) (*)
8	I/O	PD5	See module pin name (resered for user key on WSAB) (*)
9	I/O	PC2	Activates red color in D3 LED See module pin name
10	I/O	PC3	See module pin name (resered for user key on WSAB) (*)
11	I/O	PC4/PD4	See module pin name (resered for sensor on WSAB) (*)
12	I/O	PC5/PB11	See module pin name (reserved for MEMS on WSAB) (*)
13	I/O	PF2	Activates green color in D3 LED See module pin name
14	I/O	PB13	See module pin name (resered for 2-cell step-up converter on WSAB) (*)
15	GND	GND	AGND Analog ground may be used as reference for RTX4100 analog I/O's
16	I/O	PB14	See module pin name (reserved for MEMS on WSAB) (*)
17	GND		GND
18	Power	VIO	VDD_EFM RTX4100 module VIO reference voltage
19	GND		GND_WSAB Supply current by external connected circuitry

			using this ground reference will be included in the current measurement using the current sense solder points.
20	Power		VBAT+ from WSAB
21	I/O	PA3/PC1	US1_RX UART_RX signal used for eg. CoLA application download and debugging via USB virtual COM port. Also connected to Expansion connector (J9)
22	I/O	PA4	US1_TX UART_TX signal used for eg. CoLA application download and debugging via USB virtual COM port. Also connected to Expansion connector (J9)
23	I/O	PB7	See module pin name (unused on WSAB)
24	I/O	PB8	See module pin name (unused on WSAB)
25	I/O	PC6	LEU1_TX Low energy UART_TX signal used for terminal demo application via USB virtual COM port Also connected to Expansion connector (J9)
26	I/O	PC7	LEU1_RX Low energy UART_RX signal used for terminal demo application via USB virtual COM port Also connected to Expansion connector (J9)
27	I/O	PF0	DBG_SWCLK Clock for RTX2040 Unity-II (J4) if not using RXT2040 the pin is free for IO functions
28	I/O	PF1	DBG_SWDIO Data for RTX2040 Unity-II (J4) if not using RXT2040 the pin is free for IO functions
29	I	RESETn	See module pin name
30		VCC2(**)	+3V5 Step up voltage from WSAB
31	O		ADBUS2 Control signal from USB controller (for future use)
32	I		ADBUS3 Control signal from USB controller (for future use)
33	O		ADBUS4 Control signal from USB controller (for future use)
34	I		PWREN_EXTn Power enable (for future use)
35	GND		GND
36	Power	VIO	VDD_EFM RTX4100 module VIO reference voltage
37	GND		GND_WSAB Supply current by external connected circuitry using this ground reference will be included in the current measurement using the current

			sense solder points.
38	Power		VBAT+ from WSAB
39	Power		VUSB USB power from mini USB connector
40	Power		VUSB_SW_PROT USB power switched on when enumerated for 500mA by the USB host. The output is protected by a resettable fuse.

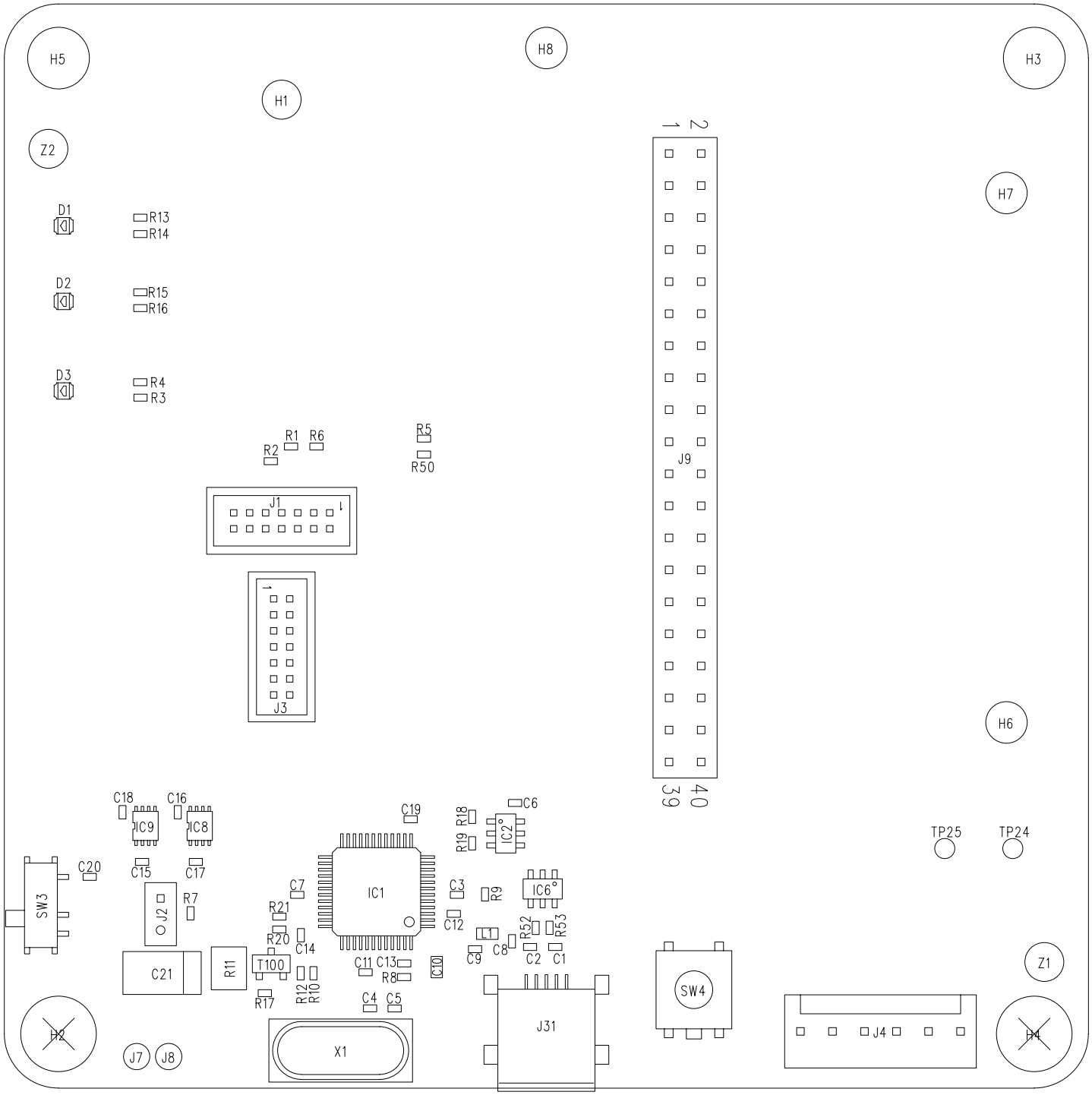
(*) To free the pins for IO functions connected via the docking connector J9 please refer to the WSAB schematics, see ([UG6]).
(**) Only valid when WSAB is configured for 2-cell operation. 2-cell operation is the default configuration.

8 Current profile measurements

The current sensing resistor (R7=0,1 Ohm) is placed in the ground path of the WSAB. This provides the option of characterizing the current profile of the application simply by using an oscilloscope. Measurements can be done using the solderpoints near R7 using a 1x probe. Connect the probe ground to the round solderpoint and the probe tip to the square solderpoint. A momentary current of 100mA will translate to -10mV on the oscilloscope. Therefore the signal should be inverted in the oscilloscope channel setup. The measurements can be used to profile or watch the active current consumption when developing and testing applications. Due to the low value of the resistor the measurements are only valid in active states with Wi-Fi activity. Sleep currents are too low to measure using the current sensing resistor, and should be done by other means.

If external circuitry is added using the expansion connector of the WSAB Docking Station it is possible to include the current consumption of added peripherals by using the GND_WSAB pins in J9 as the ground return path for the external circuits. In this way the total current consumption of a complete application can be evaluated.

9 Board documentation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H8
H3
H1
Z2
H7
D1
R13
R14
D2
R15
R16
D3
R4
R3
R1
R6
R2
R5
R50
J9
J1
J3
H6
C18
C16
C19
R18
C6
IC9
IC8
IC2
TP25
TP24
C20
C15
C17
C7
C3
IC6
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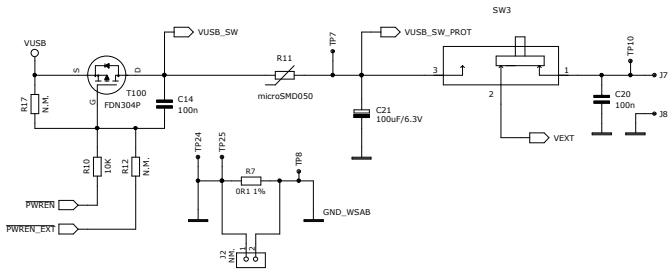

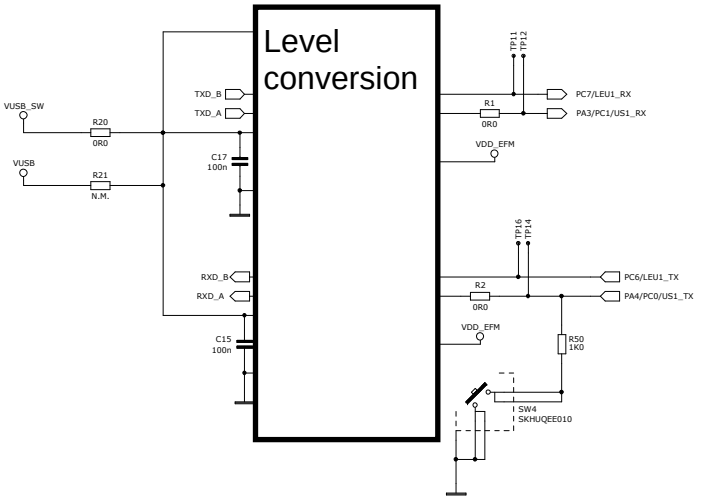

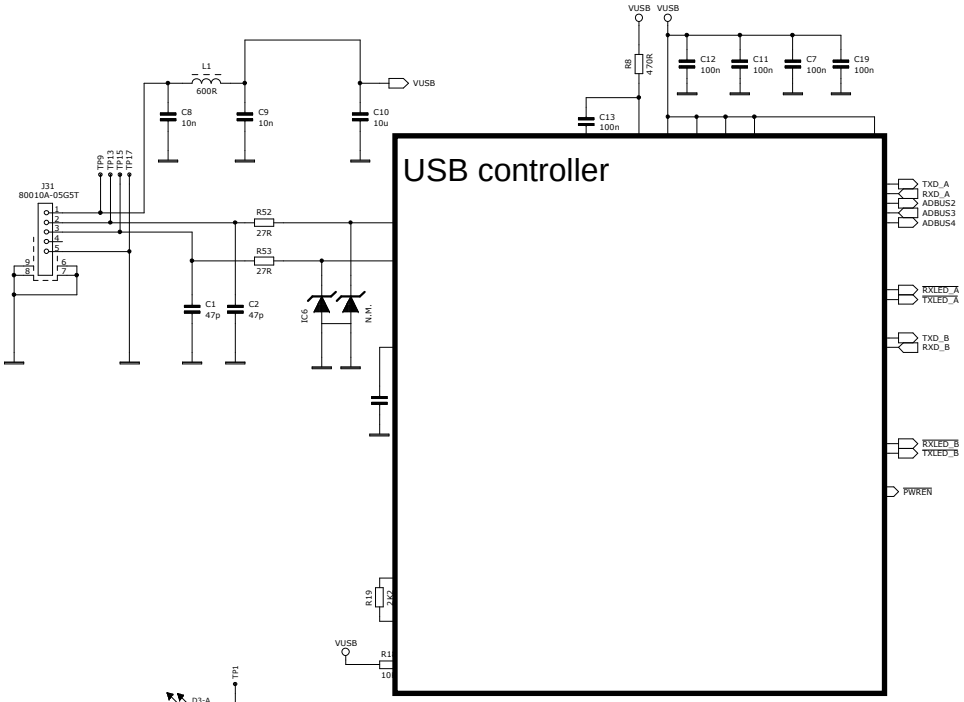

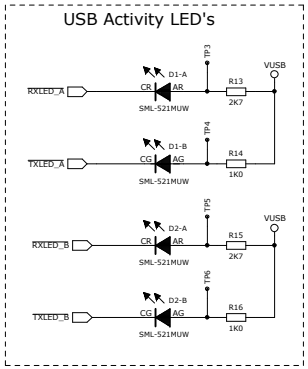

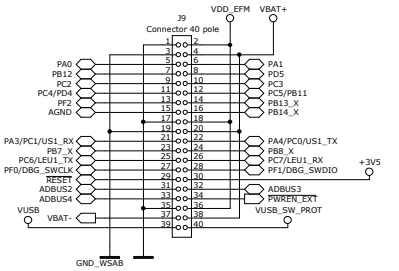

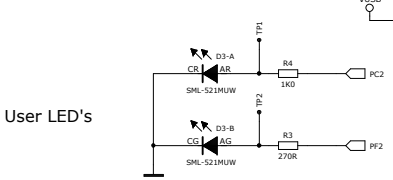

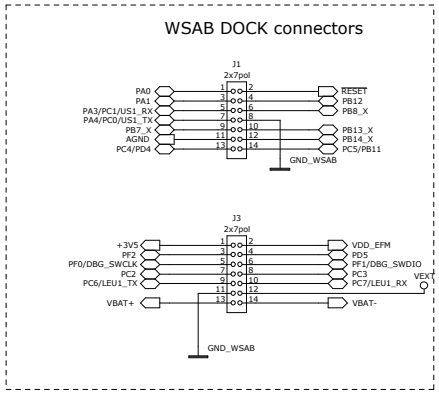

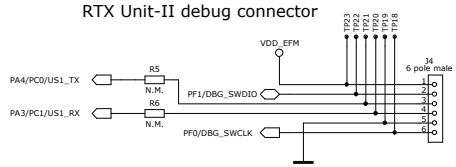

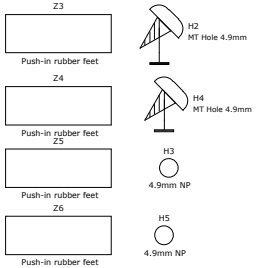

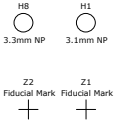

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PROJECT	Docking station for Wifi Sensor Application Board			VER	2
TITLE	MAIN			REV	A
DATE	120615	REF	TM		
FILENAME	WSAB_DOCK_V2_RA.sch				
SHEET:	1 OF 1				

10 Abbreviations

The following abbreviations are used in this document:

API	**Application Programming Interface**
BSP	**Board Support Package**
CoLA	**Co-Located Application**
GPIO	**General Purpose Input/Output**
MCU	**Micro Controller Unit**
RTOS	**Real-Time Operating System**
UART	**Universal Asynchronous Receiver/Transmitter**
WEP	**Wired Equivalent Privacy**
Wi-Fi	**Wireless Fidelity**
WPA	**Wi-Fi Protected Access**
WPS	**Wi-Fi Protected Setup**

11 Liability Disclaimer

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